Tuberculosis
Paper 10

THE ACTUAL POSITION OF THE TUBERCULOSIS PROBLEM TO-DAY

BEING

Address delivered by request at the Conference of the National Association for the Prevention of Tuberculosis at Birmingham, July, 1923.

BY

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EVENING ADDRESS

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BY

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WE must not believe all that we hear and read regarding tuberculosis. Much that is spoken and written has no foundation in fact. Tuberculosis has come to be more or less in everybody's thought and frequently on the lips of those who have but a slight acquaintance with the subject. The less knowledge on the part of the man in the street, the more voluble is his talk apt to be regarding people and things.

Experience throughout the great War has accustomed us to those who had special access to information, who knew what was happening and what was going to happen before the event, and who had infallible plans for the rout of the enemy, and a straight course to victory. We became familiar with the easy criticism of the club man in his comfortable corner, his certainly that things were going wrong and how, and why, they were going wrong, his intimate knowledge of every front at every stage, and his glib distribution of commendation or censure of men and policy. The War taught us much regarding characteristics of the herd in respect of credulity, garrulity and gullibility.

There is more than a passing analogy between the great War and the tuberculosis campaign. The point I am anxious to make for the moment is that the success of the tuberculosis campaign—which from the very nature of things, must be continuous and prolonged—is menaced and hampered by the flood of irresponsible talk at the street corner, in printed column, and even across Committee and Council table.

Natural Demand for Information.

It is not unnatural that a disease so widely distributed should be discussed widely. The misfortune lies in the circumstances and conditions of the discussion and the unblushing assurance attaching to imperfect knowledge.

The public are entitled to have full and exact information. The matter concerns intimately their life and health and that of their households. They have a right to know. The desire for help and cure on the part of sufferers is instinctive. These natural demands can be met sanely and safely from accredited sources which in this country have now been placed at the service of all.

Admitting freely those just and natural claims it is all the more a pity that the crowd should remain credulous of cheap novelties which are boomed, for the most part, from self-interest. The unfortunate itching for something fresh is not confined to the general body of the people, but emerges vaingloriously within the fighting ranks. The restless bolshevistic tendency does harm to the cause.

It is a main purpose of the Annual Conferences of the National Association for the Prevention of Tuberculosis to afford opportunity for the frank discussion of the more imminent questions in connection with the tuberculosis campaign. On the present occasion the local Executive Committee thought it would be helpful to have a Public Address on The Actual Position of the Tuberculosis Problem to-day. Hence our meeting this evening.

It seems particularly appropriate to make such a review in this place. Through the wisdom of the citizens, voiced in the enlightened policy of the City councillors, and thanks to the manifold, untiring labours of the distinguished Medical Officer of Health and his zealous band of coadjutors, Birmingham occupies an honoured and enviable place in the campaign against tuberculosis. The anti-tuberculosis operations of Birmingham are viewed with whole-hearted admiration by high authorities throughout the world.

Essential Facts.

What then, broadly, are the facts? In order to have a clear understanding of the present position, it is desirable to recall and develop certain fundamental points.

Tuberculosis has been known from antiquity. It has appeared in all civilizations. Yet, while recognized more or less clearly at the bed-side, it was entirely misunderstood until a century ago, and largely misconceived until the latter half of the 19th century. It was then that thinkers in different countries seriously tackled the subject and intensive, concerted action was rendered possible by the final determination once for all of the infective nature of the disease.

It is, after all, only forty years since that essential fact was determined. I remember vividly the excitement caused in the embryological laboratory where I was then working by the announcement of the discovery of the tubercle bacillus. We dropped our several researches in order to test the value of the statement. Complete corroboration of Koch's discovery followed. Since then the enemy has been kept well in view. Gradually we have realized the possibilities which knowledge of the essential cause implied. Forty years of steady work have brought us a long way forward.

Orientation of Present Front.

In a protracted campaign it is well, from time to time, to pause and do a little orientation. To that I invite you to-night. It is no easy thing for those who have not passed through the campaign to view it with sufficient width and in proper proportion.

Since the discovery of the enemy, it has necessarily been, for the most part, a campaign of trench-warfare. By those who know most about it, this is recognized as inevitable. Advance has been made point after point by skilled and thoughtful officers. Positions that have been gained have been repeatedly threatened by prejudice and folly. It has been a slow up-hill fight. While much has been attained, much remains to be done.

Let us try to visualize the actual position in the light of past achievements and up-to-date intelligence.

Tuberculosis now figures in the group of infective diseases. The principles which have been found serviceable in combating other infectious diseases are broadly applicable to tuberculosis. The realization of this is the basis of all successful effort. Those principles have been embodied in certain provisions of the Public Health Acts of the several divisions of the Kingdom. The provisions apply to tuberculosis as an infective disease. It is no less true that tuberculosis presents characteristics all its own which separate it from most diseases of the class.

The advance of tuberculous infection is slow and insidious. At the commencement the outward manifestations are relatively slight. They are constantly missed. The affection tends to pass unnoticed under the cloak of constitutional delicacy. The tubercle bacillus has too commonly acquired a firm foot-hold before its presence is admitted. By the time the diagnosis is made, anatomical and physiological disturbance has been effected which require time and patience to correct. Tuberculosis takes a long time to come and, just because of that, takes a long time to go.

Again, tuberculosis differs from most infective diseases by reason of the variety of its manifestations. The features of the disease are constantly changing. In place of limiting its attack chiefly to the lungs—as is commonly supposed—the disease is frequently present *without* affecting the lungs at all. The lung affection has filled, and still continues to fill, too large a place in the current conception of the disease. Tuberculosis may attack any organ in the body. It may attack any number of organs. It wanders from point to point by a variety of channels, not twice exactly in the same way.

It plays havoc with vital structures, disintegrating tissue and disturbing functional activity. As its deadly grip increases, the tubercle bacillus tends to poison the system widely by disseminating toxic (poisonous) products produced by its residence within the body.

Again, in respect of duration, tuberculosis differs from most infections. In place of lasting a measured length of days, it lasts months, or years—it may be many years—with recurrent bouts of gravity bringing anxiety and danger throughout a life time.

Amidst this staggering variety of manifestation certain facts remain fixed—of paramount importance. The last few years have enlarged and stabilized our knowledge remarkably.

Fundamental Positions.

Let us review some of the fundamental positions.

(1) However varied may be the outward (clinical) manifestation, the essential cause remains the same. Without the presence of the infecting bacillus within the system there is no tuberculosis.

(2) The bacillus enters the human subject by passage from a previously affected man or animal.

(3) While certain avenues are more frequent, entrance of the bacillus into the body may be affected at *any* point.

(4) Whatever the point of entrance, the bacillus passes commonly with the circulating body-fluids to the glandular system and thence to one or other organ where, on settlement, it begins to reproduce its kind. A process of colonization is established. Similar results follow wherever such settlement occurs.

(5) A struggle ensues between the invader and the cells of the tissue invaded. The result depends on the degree of resistance offered by the latter. Where resistance is relatively low, destruction (disintegration) of tissue or organ results. In proportion as tissue resistance is great, further spread of the infection is opposed by the production of a natural barrier —firm, fibrous tissue—within which barrier the imprisoned bacilli are of little account. In the absence of such barrier, the bacilli and their poisonous products may be carried anywhere at any time.

(6) The outcome may be in one or other of two main directions. On the one hand, there may be progressive dis-

integration of tissue, disturbance of function and systemic intoxication which leads towards general disorganization and death; on the other hand, the early local reaction may result in effective resistance, imprisonment or annihilation of the invader, and the establishment of more or less immunity against further attack.

Ubiquity of the Invader.

(7) Infection with tuberculosis, in some degree, is so frequent, in civilized communities, that it may be regarded as almost universal. Yet, while invasion is thus widespread, the percentage of mortality is relatively low. In other words, the natural resistance presented by the majority of the race is sufficient to meet and counter the inroad of the invader. A chief difficulty lies in the fact that the resistance offered by different persons at different times is subject to variation. Were resistance a fixed quantity, the problem would be relatively simple. The degree of resistance varies endlessly in different individuals and in the same individual at different ages and under different conditions of environment.

(8) The fact of universality of tuberculous infection is not to be construed in a disquieting sense. In reality it constitutes one of the most reassuring aspects of the problem. If reliable statistics from different countries indicate that the majority of persons become tuberculized at some point in their life history —and the classic observations (Nägeli, Reinhart) are remarkably confirmed by investigations now in progress in this country—and if, as the Registrar-General's Report for England and Wales (1920) shows, less than 10 per cent of all deaths are officially attributed to tuberculosis, it is abundantly evident that the great majority of persons infected with tuberculosis succeed in offering an effective resistance.

This fact has immense practical significance and affords scientific warrant for untiring effort towards the improvement of the environment of the individual with a view to the enhancement of his resistance.

Other facts tending towards the same practical conclusion have been unearthed through the tuberculosis campaign.

Collectively, they have given sanction and impetus to the demand for improved conditions of housing.

Menace to Childhood.

(9) Another illuminating consideration which deserves broadcasting in fullest degree is found in the well-ascertained fact that among civilized people tuberculosis is, for the most part, acquired in childhood. The evidence in support of the view is conclusive.

Tuberculosis may thus be looked on as a kind of distemper which the young "human" is likely to acquire early in life. It differs, however, from the commonly occurring distemper of the canine species in that, while the latter is an acute process, quickly over, tuberculosis, once engendered, is apt to continue —whether producing symptoms or not—throughout years, it may be throughout an entire lifetime. There is abundant reason to believe that—much more than is commonly suspected —symptoms of ill health and disturbed growth and development in childhood are referable to tuberculous infection lurking in the system. It were well if recurrent bouts of illness and continued delicacy in a child and obscure manifestations of impaired health at later ages were carefully scrutinized as possibly dependent on such infection.

The frequency of that dependence requires to be brought home to the imagination of parents and guardians—and must be emphasized in the training of doctors. With the possibility in mind, the growing child should be reviewed at successive intervals from birth onwards. Simple clinical tests are available which, if applied at intervals, say, of six months or oftener, as may seem desirable, can decide positively whether or not the child has become infected.

If well directed attention on such lines were given to the child, the possible consequences of infection might be largely discounted. The later, gross manifestations of tuberculosis result, for the most part, from failure to observe and interpret correctly the occurrence of early infection. This is a matter calling for practical action.

Repeated Attacks?

(10) Can the individual, once successfully attacked, be re-infected? Can a second infection be implanted on the first? There is accumulating evidence that tuberculosis present in the system confers immunity from a fresh infection. Experimental observations—notably those centred around what is known as *Koch's phenomenon*—indicate that tuberculous infection confers such immunity. Subsequent manifestations of tuberculosis, of whatever kind and degree, are not referable to a fresh infection, but are to be interpreted as a further spurt within the system of the primary infection which may be so quiescent for months or years as to give the impression, that it has been extinguished.

Such observations throw light on the popular view that tuberculosis of glands, when arrested, gives protection against so-called "consumption." The popular view is based on a hasty generalization from a limited number of cases where, after gross glandular involvement, no further evidence of tuberculosis has been noticed. In so far as such observations have been correct, they imply nothing more, however, than that tuberculosis in an individual may be satisfactorily countered at different stages, and notably at the stage of glandular involvement, which is commonly the earliest indication of the spreading infection.

Efficient Scouting.

If there were, on the part of doctors and guardians, a clear appreciation of the true significance of the glandular stage of tuberculosis as the primary register of a progressive disease, and its appropriate curative measures were enforced right away, permanent arrests of the spreading infection would become the order of the day. The practical lesson is that careful regard must be given to the first budding of the seedling of tuberculosis rather than wait for the later efflorescence, when disease is firmly rooted in the body. There is a moment in time when the infective bacillus reaching a suitable *nidus*, germinates. That seedling stage is realized, for the most part, in childhood. By the time puberty has been reached, the majority of children

have been tuberculized. The first trace of the seedling must be scrupulously watched for and no stone left unturned to limit its development. All sound efforts towards child welfare, especially in so far as they imply correction of the faulty, compulsory environment of the infant, constitute measures of much importance in the prevention of tuberculosis.

(11) The detection of tuberculous infection at the first possible moment is the key to the situation. The occurrence is easily recognized by the tests already referred to. Whenever infection has been determined, the individual should be intelligently and sensibly viewed from the preventive point of view—not treated as an invalid, but rather as one who has reached a crucial experience in life. If, as is the case with most persons, natural resistance is sufficient to meet the threatened invasion, we may thank heaven and let well alone. If doubt remains, if recurrent minor aliments are unduly common, the presence of the lurking invader should be kept in mind as the possible explanation.

In what has preceded I have endeavoured to give a rapid sketch of the chief features of tuberculous infection based on accumulating clinical, experimental and pathological observations.

Can Infection be Excluded?

What is the bearing of such facts on the tuberculosis campaign? Can we expect to prevent infection? To what extent can we limit its occurrence? Is the attempt to be regarded as a practical line of endeavour at the present time?

The answer must be that, under existing conditions—notably those of housing, industrial life, and food supplies—it is difficult to exclude the *chance* of infection attaching to the presence of infected individuals and animals. Collective evidence from many countries has shown that the vast majority of adults respond positively to the tests. In children the percentage of positive re-actions increases gradually from infancy onwards

This does not mean that attention is not to be directed to limitation of sources of infection. Quite the reverse. The value of endeavour in that direction has been accentuated by a generation of observers in the sphere alike of human and of veterinary pathology. It is voiced in sound anti-tuberculosis schemes by arrangements for the segregation of advanced cases. It can hardly be emphasized over much in relation to the milk supply of the country.

As a matter of practical politics, however, the tuberculous seed is too abundant to justify the hope that meantime we can expect to *exclude* infection altogether.

Assuming that, under existing conditions of civilization, most individuals become tuberculized sooner or later, something may be said in favour of the contraction of infection in childhood, provided that due attention is directed to the *exact determination of the advent* of infection and provided that the results of infection are understood and anticipated.

It must be recalled that individual members of primitive races, coming as adults for the first time into contact with civilization, are apt to develop tuberculosis in aggravated, often acutely fatal form. In other words, what we may term "infantile" tuberculosis, when acquired in adult life, is of much graver portent than when it occurs in childhood.

Limitation of Results of Infection.

What then should be our present practical outlook? We may assume that the child, under existing conditions, will become inoculated with tuberculosis sooner or later. The occurrence should be *watched for* by parent and doctor, who must be trained to interpret its meaning and bearings.

The occurrence should be recorded with exactness, and appropriate measures adopted to develop and increase natural resistance. Recurrent ailments and obscure conditions of ill health should be considered in the light which the fact of infection affords. The natural history of the disease—the remarkable variation of incident—requires to be better apprehended by all who have responsible charge of child life, if there

is to be a practical appreciation of the possibilities attaching to infection and the means by which natural resistance may be enhanced.

Granted there has been determined a recent spreading infection, by the appearance of one or other of the simpler focal manifestations, *e.g.* in glands or elsewhere, two lines of procedure present themselves.

On the one hand, our aim must be to insist that the developing child shall enjoy such conditions of immediate (compulsory) environment as tend physiologically to develop and maintain resistance. This implies provision of air and sunlight—both at home and at school—in much greater degree than is commonly given, suitability of food, and sufficiency of movement, which is essential for the growth of bone and muscle and the easy flow of body fluids.

Tuberculization Met by *De*tuberculization.

On the other hand, we should make a bold bid to arrest the advance of infection within the system. We must seek to anticipate or prevent completer tuberculization by a process of effective *de*tuberculization. We must keep in view the possibility of re-enforcing natural resistance by the procedure known as active immunization.

The conception of *anticipatory detuberculization* seems the key to the situation. Continuous observations throughout many years and in numerous instances have convinced me that, by a simple adaptation of tuberculin treatment, a vast deal may be achieved towards *de*tuberculization of the infected child. Were I the parent of young children, I should insist on it.

If the percutaneous exhibition of tuberculin, which is harmless, painless and effective, be maintained for months—perhaps long after the particular incident for which it was begun—there is commonly recognized a continuing, beneficial influence, expressed by general improvement of health and condition. This is difficult to interpret otherwise than as the result of *de*tuberculization effected by the process of active immunization.

If such a line of procedure were systematically followed for the detection of tuberculosis and for its *anticipative* treatment from the moment of detection, there seems no doubt that we should arrest the occurrence of *graver* tuberculosis at the fountain-head, and, within a few years reduce morbidity and mortality beyond most sanguine expectation. Purposeful, concerted action on those lines—in proportion as it may be made applicable to the developing childhood of the race—carries with it almost unlimited possibilities in respect of the ultimate eradication of tuberculosis.

Provision for Present Sufferers.

Assuming that effective provision has been made for the anticipative treatment of infection in childhood as the potential source of tuberculous manifestations in later life, we are still faced, and will be faced for years to come, by a vast number of cases of *pronounced* disease at all ages and in all stages. However successful methods of anticipative *de*tuberculization may prove, there will remain, for a generation at least, the need of suitable provision for persons already crippled or lamed by the disease and for persons who, by reason of the advanced stage of their illness, are not only irrecoverable, but form a likely source of infection to those who, from one or other environmental cause, are brought into recurrent, close contact with them.

Prolonged study of the natural history of the disease—its ubiquity, its evasiveness, its variation in feature and duration, its curability in some instances, its chronicity in others, and its inevitably downward, fatal course in others—has gradually led to a fairly common understanding as to the machinery that is practically desirable for handling the tuberculosis meanwhile present in the community.

Systematic Tracking of the Enemy.

An effective anti-tuberculosis programme cannot be limited to the care of cases as they turn up. The tuberculosis problem presents much larger issues. Each case that turns up affords the clue to further cases. Every clue must be followed up.

Tuberculosis with its far-reaching ramifications throughout communal life must be *sought for*, must be *hunted down*. The aim of effective machinery is that not a single case of tuberculosis shall remain unrecognized and uncared for in the community.

The care (individual and communal) must be *continuous*, from the time the condition is recognized as requiring care, until the arrest of disease or the death of the individual. If it is to be effective, the care of the tuberculous, which commences at the moment of diagnosis, must in one form or another, be maintained uninterruptedly. The term "after-care"—so frequently in use—is misleading, in so far as it may imply a limitation to *continuity* of care throughout.

The several elements which go to constitute efficient anti-tuberculosis machinery were evolved naturally from extending operations in the field. Each constituent element is the expression of an ascertained need.

Field Operations. Headquarters: The Tuberculosis Dispensary.

First in point of time, following closely on the discovery of the infective organism, came the conception of a centre of operations in each community, concerned with every aspect of tuberculosis—the headquarters of field operations. That was the idea before me in establishing, in 1887, the Tuberculosis Dispensary.

In proportion as it fulfils its function, the Tuberculosis Dispensary constitutes a collecting centre where cases from manifold sources are received and through which, by the systematic examination of homes and of households—the "march-past of the contacts"—numberless cases are discovered and, forthwith, placed under suitable treatment. By following the patient to his residence we get at the " nests " of tuberculosis. Sources of infection—little suspected—may be disclosed and environment is studied with a view to correction of faulty conditions.

The Tuberculosis Dispensary serves as a centre for the continuous surveillance and treatment of a certain number of ambulant patients, and a " clearing-house " for others, distributing them to sanatorium, hospital, or other institution as may be desirable. The Tuberculosis Dispensary constitutes, further, an information bureau for all interested inquirers.

The Tuberculosis Dispensary should be linked closely with every other agency concerned with the care and treatment of tuberculous patients. If wisely administered, it will inevitably come to be the trusted auxiliary of the ordinary practitioners, who are responsible for the treatment of the larger proportion of the community at their own homes. The resources of the Dispensary should be at the service of practitioners in the fullest possible way.

The Care Committee.

The Tuberculosis Dispensary, through its Care Committee, concerns itself with economic considerations, which inevitably, arise in relation to tuberculosis as it occurs among the poorer classes. Beyond the provision of medical care, the economic consequences of the disease must in many cases be faced, affecting as they commonly do not only the sick individual but an entire household. This is the special sphere of Care Committees. The care must be *continuous* (v. p. 13).

Incidentally, let me here interject that, in the case of workers, it would seem just, that in proportion as tuberculosis in a given case can be traced to unhealthy conditions of work—in other words, to vitiation of compulsory environment—the sufferer should be compensated no less than is the man who may be injured through accident at work. The high mortality from tuberculosis in certain trades affords a strong plea. The principle of compensation in relation to tuberculosis has been recognized in the matter of army pensions.

Without such provision, the difficulties which attend the prolonged treatment of cases occurring among the industrial classes are almost insuperable. Especially is this true of treatment proposed at the beginning of tuberculous illness when,

apart from such provision, the individual is tempted to continue at work because of the apparent slightness of symptoms and the economic hardship which continued absence from duty entails.

The Sanatorium.

The *essential* purpose of the Sanatorium is treatment of *early* cases of tuberculosis, with a view to effective *arrest* of the disease. The Tuberculosis Dispensary, in co-operation with the general practitioners of the area, forms a natural centre for the selection of cases suitable for the Sanatorium. Had such procedure been consistently followed in the past, and admission to the Sanatorium been limited to cases truly capable of arrest, we should have been saved from much of the disappointment with which the Sanatorium is viewed.

As the result of muddling—innocent and perverse—the essential purpose of the Sanatorium has been largely lost sight of. In many places the Sanatorium has been allowed to become the dumping ground for every sort of case, the undesirable (chronic or advanced) being much in evidence. The result has been hopeless confusion, the piling up of long waiting lists, and the blocking of sanatoriums against suitable cases until, in many instances, the suitable have perforce lapsed into the unsuitable.

The Sanatorium, in place of fulfilling its special purpose in the campaign, namely, the arrest of disease in early cases, has by reason of the hopeless method of giving everyone his turn—two or three months apiece—drifted into being little more than a temporary shelter for the patching up of damaged lives.

The Sanatorium must be restored to its proper purpose. The immense significance of sanatorium treatment, when properly directed, is acknowledged by the great majority of those who are in a position to judge of practical results.

Hospital for Advanced Cases.

The Hospital, in contrast with the Sanatorium, is an institution destined for the care of persons in more advanced

stages of tuberculosis. While affording ready help to such patients in more acute emergencies and educating tuberculous patients how to look after themselves, the Hospital finds its particular sphere in the continued segregation of patients at advanced stages of tuberculosis, who are discharging abundant tubercle bacilli. It contributes thereby to the limitation of sources of infection in households, where domestic conditions are likely to foster its spread.

The first claim on hospitals for advanced cases seems obviously the admission of those occurring in contracted dwellings—particularly one- and two-roomed houses—when family circumstances involve close proximity of the patient to developing young life.

Working Colony.

As we have just seen, the essential purpose of the Sanatorium is to achieve an effective arrest of disease in cases capable of such arrest. The primary object of the Sanatorium is not, as stated by a recent writer "to fit the patient for the occupation with which he was engaged before the onset of his illness." In many cases, the character of that occupation and the unsatisfactory compulsory environment attaching thereto, has led to the illness. In other cases, the arrest that may be achieved can only be maintained, if an approach to sanatorium conditions can be carried forward into the patient's after life. In a certain percentage of cases, effective arrest is only to be obtained by retention of the patient under immediate medical direction for a much longer period than is economically feasible at the Sanatorium.

Regard to such considerations led me to propose the Working Colony as an institution supplementary to the Sanatorium—for a limited group of cases—for the more prolonged treatment of the disease, with a view to its ultimate arrest, and for the concurrent occupation or formal training of such persons in various remunerative branches of work, agricultural and industrial. In so far as it has been directed to its special purpose, the Working Colony has proved a conspicuous success, therapeutically and economically. Burrow Hill Colony,

Frimley, established by the National Association for the Prevention of Tuberculosis, constitutes an excellent model in this portion of the field.

For a selected number of cases where still more prolonged medical surveillance is desirable, the need may be met by (1) the establishment of municipal or voluntary workshops under medical guidance, or (2) small holdings forming part of, or adjacent to, the Working Colony, where the colonist, after completion of immediate treatment and training, could continue to work out his physical and economic salvation under general guidance from the Colony officers, or (3) residential settlements for those who may, for one reason or another, seem unfitted for return to more normal conditions of life.

Open-Air School.

In the case of young children, the Open-Air School—either residential or day-school—plays a similar part by providing for sufficient continuity of medical treatment *concurrently* with a measured degree of education, proportionate to the physical condition of the individual patient.

Correlation of Forces: The Tuberculosis Scheme.

Those several institutions for the care of tuberculous patients at various stages—each adapted as perfectly as possible for its special purpose—must be correlated. Such correlation was a natural evolution from the necessities of the problem and has been recognized in the pattern Tuberculosis Scheme, recommended by the Departmental Committee on Tuberculosis and adopted by the Government of this country. The subsequent Inter-departmental Committee on Tuberculosis emphasized the point. In the opinion of both Committees, it is imperative that there should be a general adoption throughout the country of the co-ordinated scheme of anti-tuberculosis institutions. The Report of the latter Committee expressed the view "that the best interests, both of the country and of the ex-service man, will be served, first by making the best possible use of all existing means of treatment, and then by expanding, improving and increasing these means as rapidly as possible."

The Tuberculosis Scheme, as now recognized in this country, is a composite machine, in which each element is conceived and adjusted for its own purpose, and the several elements operate in close connection one with the other, for the better functioning of the whole. It is foolish to contrast one element with the other and to suggest that one element may be utilized effectively to the exclusion of the others. In proportion as the several elements are isolated, however perfect for their respective purposes, much of their value is lost. In combination they form an organic whole of high potentiality.

An ancient story tells :—Four blind men went to see an elephant. One touched the leg of the elephant, and said, "The elephant is like a pillar." The second touched the trunk, and said, "The elephant is like a thick stick or club." The third touched the belly, and said, "The elephant is like a big jar." The fourth touched the ears, and said, "The elephant is like a winnowing basket." Thus they began to dispute amongst themselves as to the figure of the elephant. A passer-by seeing them quarrel, said, "What is it that you are disputing about"? They told him everything and asked him to arbitrate. That man said, "None of you has seen the elephant. The elephant is not like a pillar, its legs are like pillars. It is not like a big water-vessel, its belly is like a water-vessel. It is not like a winnowing basket, its ears are like winnowing baskets. It is not like a thick stick or club, but its proboscis is like that. The elephant is the combination of all these."

National Rally.

It is gratifying to find that, in most parts of the country, a loyal endeavour has been made to realize the Tuberculosis Scheme for the several areas. But for the tragic interruption of the War, the condition would have been more uniformly satisfactory. In some cases the War has, unfortunately, been made the excuse for hesitancy and delay. None the less, the machine is gradually getting to work. It will require untiring effort and perseverance to cover the immense field. To those who understand the problem it goes without saying that much patience will be required in the appraisement of results.

Short-sighted Criticism.

This seems clear as noon-day. Yet, with amazing thoughtlessness it has been lightly affirmed that the national anti-tuberculosis programme has failed. The short-sighted critics have been unable to appreciate the magnitude of the campaign and the conditions under which it is waged. They have forgotten that, even were the machinery complete and in good working order, clearly assessable results could only be reached after *years* of labour. They have overlooked the hiatus forced on us by the War. They disregard the pathology and natural history of tuberculosis and, in a disease whose duration must be measured by years, demand results such as could hardly be attained, were the duration to be measured by days.

The moral of experience up to date is, not to scrap the machinery, but to insist on the proper finish and adjustment of every part for its use, and to see that the well-fitting machine is burnished and oiled so as to run smoothly and, no less, that the officers in charge are encouraged and assisted in fullest degree.

What possible purpose can be served by timid, hysterical ejaculations like those cited sympathetically by the writer of a recent volume? "It would seem"—runs the mournful wail—"as though the Tuberculosis Movement at the present time has ceased to move. Leaders do not appear to lead. Many workers are discouraged and have withdrawn from service. . . . There is no enthusiasm among Tuberculosis Officers. Tuberculosis Schemes have but little life in them. Conductors of sanatoria are disappointed with results. Patients are disheartened, and everywhere there seems to be depression. The Tuberculosis Movement lacks soul and is deficient in aims, organization and financial means."

Travesty of Actual Facts.

Why should a wise man utter folly and fill his belly with east wind? Why should he reason with unprofitable talk or with subjects wherewith he can do no good?

From intimate, close association with many sections of tuberculosis activity in different parts of the country, I have no hesitation in saying that the timorous outcry is a complete travesty of the facts. Difficulties, of course, present themselves in the best directed work. Necessarily flaws are discoverable in the various machines turned out to rapid order when the great push in the anti-tuberculosis campaign was begun ten years ago, and the legislature first tackled the subject. Men may possibly have been admitted in charge of machines whose energies would have been better directed elsewhere. But the potential of the machine is great and a large proportion of the officers in charge are excellent--keen, conscientious and inspired by a patience and determination, which will put the business through, if only they get adequate recognition and facilities, and are given time to stick-out the trench-warfare which alone, by the necessities of the case, will open the road to final success.

I would remind doleful Jeremiahs that "the husbandman waiteth for the precious fruit of the earth, and hath long patience for it, until he receives the early and latter rain."

Happily, the growing experience of the world—the older civilizations and the new—is steadily in favour of the adoption of the correlated measures of which we have spoken. From wanderings in many directions and from conversations with men of all countries at international gatherings, my sure conviction is that never was there sounder endeavour or greater hopefulness on the part of those entitled to speak. To statistics which throw light on what has been achieved we shall return presently.

Ground Gained.

It may be serviceable to rehearse some of the advantages attaching to the measures directed against tuberculosis, which are now more or less efficiently in operation throughout this country.

(1) Notification. The statement that notification is incomplete, because only a percentage of cases occurring in an area are notified, and because, it may be, cases dying from tuberculosis have not been notified at all, detracts little from the convincing evidence in favour of a method, whereby detailed

information is obtained regarding the distribution and relations of a disease whose ramifications are intricate and wide-spread throughout the community.

By means of notification from a variety of sources--from none more satisfactorily than by way of the Tuberculosis Dispensary—information has been obtained as to the whereabouts of disease, that would otherwise have been overlooked. Patients and infected homes have been brought within range of curative and preventive measures to a degree, that in bygone times would have been impossible, indeed, was never dreamt of. The doctors of the country constitute chief auxiliaries in this Intelligence Department and growingly their attention is being directed to the necessity of early diagnosis. In proportion as their training and experience increase, we may trust that their patriotism and *esprit de corps* will effect earlier and completer notification of the disease.

(2) The establishment of a recognized centre—the Tuberculosis Dispensary—towards which patients and inquirers of all kinds regarding tuberculosis may be directed—has meant the detection of cases that would otherwise have escaped attention and the handling of the extensive and varied clinical material on scientific and business-like lines.

(3) The systematized visitation of homes by doctors and nurses from the Tuberculosis Dispensary has had many advantages both direct, in respect of the immediate patient under observation, and indirect, by the general improvement of domestic environment throughout the community and a corresponding elevation of resistance.

(4) The systematic examination of contacts, in so far as it has been effectively prosecuted, has not failed to reduce the number of grosser cases which, in pre-Dispensary days, were allowed to develop without observation or restraint.

(5) The systematic examination of sputum and other discharges from suspected cases has been directly serviceable. The regularized system of examination has tended to make doctors more alert and has quickened public interest in numerous aspects of the disease.

(6) The Sanatorium has not only been of immediate benefit to a great number of patients, but has been a telling object lesson to the community regarding the value of air, sunlight, and other physiological measures. It has reformed the outlook of the physician in relation to the treatment not merely of tuberculosis but of other diseases.

(7) The Hospital for advanced cases, by means of the segregation thus rendered possible, has tended both directly and indirectly to diminish risks from the presence of the tubercle bacillus in open carriers of the disease.

Alongside those more special measures, may be mentioned the growing education of the community regarding the disease, its character, causation and methods of prevention. The actual term "tuberculosis," which was little used even by doctors a generation ago, is now in the ordinary vocabulary of our people, and many of them are beginning to understand its meaning.

The relations of the milk supply of a community to the occurrence of tuberculosis and the need for a sound supply are widely realized, and, if less rapidly than might be desired, Health Authorities, both central and local, are directing attention to the subject.

Although the War interfered in numerous directions with the development of anti-tuberculosis measures and in various ways stayed progress, it has brought in its train incidental advantages, notably the systematic medical examination of a large part of the population, and has emphasized the benefits therefrom which might be realized in civil life. It has secured the attention of the nation to economic aspects of the problem which had hitherto received little consideration.

More broadly, the tuberculosis campaign has aroused a wide-spread interest in matters pertaining to health and the prevention of disease. It has effectively stimulated the "health conscience" of the nation. By the information obtained from the domiciliary visitation of households, it has focussed attention on housing conditions and has done much to illuminate the question. Lines of thought and methods which were introduced in relation to the anti-tuberculosis movement have

been frankly adopted and developed in relation to maternity and child welfare, insanity, venereal diseases, and more generally in other departments of medicine. The wide adoption of such methods, notably in the case of child welfare, has in turn had a favourable reflex effect on the anti-tuberculosis campaign.

Estimate for Local Campaign.

In contemplating a local scheme for the control of tuberculosis, it is essential to have an approximate estimate of the amount of tuberculosis to be dealt with and its distribution throughout the given area. This estimate will form the basis for specification of the kind and amount of machinery. The more accurate the knowledge of the facts, the more exact and sufficient will be the direction of effort. Certain working data are available for the purpose. The data include the population of the area, and broad facts as to the housing and working conditions of the inhabitants, general death-rate, death-rate from tuberculosis in several forms, and facts regarding milk supply.

From the recorded mortality from tuberculosis a calculation may be made as to the amount of tuberculosis likely to require (*a*) more immediate treatment, (*b*) more general medical surveillance.

In this connection I expressed the view—at the International Congress on Tuberculosis at Washington in 1908—that most calculations as to the incidence of tuberculosis *under*-estimated the amount. Various computations led me to state that a *minimal* basis for assessing the incidence of tuberculosis *requiring immediate attention* in any district is obtainable by multiplying the recorded number of deaths from tuberculosis by ten. It seemed to me probable that that multiple would be found to understate the actual fact, and that the multiple, twenty, might be adopted without exaggeration. Subsequent experience has tended to confirm the validity of the view.

Within the past few years, observations have been undertaken on an extensive scale in several centres, having in view the

appraisement of the amount of tuberculosis worthy of consideration in the given community. These have afforded striking confirmation of the opinion recorded. The results of the Framingham Community Health and Tuberculosis Demonstration went to show that there were in the Community approximately twenty cases for every death, and of these, ten showed evidence of present activity. In keeping with this is the fact that after three years of inquiry 200 cases of tuberculosis were under observation as compared with 27 at the beginning of the demonstration.

Similarly, a survey undertaken in relation to the city of Chicago led to the conclusion that the number of cases of tuberculosis to be dealt with in Chicago was probably more than seventeen times the number of reported deaths from the disease.

The Place of Voluntary Effort.

In considering the needs of a community and endeavouring to satisfy them in a Tuberculosis Scheme for the area in question, those in responsible administrative position will do well to keep in mind the large part which has been played by voluntary societies and agencies in the treatment and prevention of tuberculosis. It can never be forgotten that the modern tuberculosis movement in this country, and, indeed, throughout the world, had its inspiration and origin in volunteer effort.

Apart from, and sometimes in co-operation with, local health authorities—and long before the anti-tuberculosis campaign was recognized officially—voluntary bodies served as pioneers, initiating the movement in their respective areas and founding and maintaining institutions for tuberculosis. It is difficult to estimate too highly what has thus been achieved by the Hospitals of Great Britain, the National Association for the Prevention of Tuberculosis, directly and through its Branches, the Central Fund for the Promotion of Tuberculosis Dispensaries in London, the Royal Victoria Hospital Tuberculosis Trust in Scotland, and corresponding associations throughout the world.

Largely through the operations of those agencies the ground was prepared for the official activities now in operation. The part they have played was frankly recognized by the Depart-

mental Committee on Tuberculosis who expressed "great appreciation of the work and the hope that it might all be duly correlated to the Tuberculosis Scheme." The Committee recommended that, in the framing of complete schemes, " regard should be had to all the existing available authorities, organizations and institutions with a view to avoiding waste by overlapping and to obtaining their co-operation and inclusion within the schemes proposed."

Such co-operation is evidently of capital importance from various points of view. The field of tuberculosis is co-extensive with our civilization. The needs created by the ravages of the disease are many and call for effort on generous lines—curative, preventive, social and economic. In some shape or fashion the issues concern most members of the community sooner or later. It is up to every member of the community, not only to pay the taxed contribution, but to see that, in the handling of the racial blight, administrative effort is re-enforced by human touch,

Particularly at a time when the resources of the nation are over-strained, the call to continued co-operation between the official and the voluntary is imperative.

Sustained voluntary interest can be of the utmost service. The Local Authority needs such sympathetic support in its effort to maintain tuberculosis activity up to the mark. Gaps still remain frequent in connection with one or other group of sufferers. Those can readily be bridged over through the efforts of voluntary agencies.

Money for Research.

Help is required for research with a view to further advances in prevention and treatment. Research costs money. The wealthy citizen, of humane instincts, will find in tuberculosis a fruitful field, with certainty of return for money so invested.

Beyond Statutory Requirement.

To illustrate how *living* schemes may continue to develop and fructify after more routine activities have assumed an official character, let me cite the widened horizon which opened out to those who had been responsible for the Edinburgh Tuberculosis

Scheme, when the time came to merge voluntary in official management of sanatorium and hospital. The example may prove helpful to similar agencies concerned with tuberculosis who, by reason of official activity, may have thought that volunteer effort had been superseded and they had better close down.

Far from adopting that view, the Edinburgh Committee, on gifting the Dispensary, Sanatorium and Farm Colony to the City, resolved to continue their endeavour in relation to every group of the community and every type of case brought under their notice for which, through one cause or another, official provision appeared to be inadequate. This has meant the expenditure of large funds and much effort in relation to claims incessantly submitted on behalf of such cases. It has led to the establishment of an extensive Sanatorium-Colony for the reception and treatment of such patients who, either by reason of the nature of the case—difficult, obscure manifestations of tuberculosis requiring more special or more prolonged treatment than was possible elsewhere—or by reason of special social circumstances, could not obtain it otherwise.

Training of Doctors.

Realizing that one of the most clamant wants in the tuberculosis campaign was more thorough training of medical practitioners in the subject of tuberculosis, the Trust approached the University of Edinburgh with the proposal that a Lectureship or Chair should be created in the University to meet that want. The proposal was sympathetically received and finally took shape in the gift by the Trust of £18,000 for the foundation of a Chair of Tuberculosis. The result has been that the subject of tuberculosis is now compulsory in the University curriculum and every student must attend a course of thirty meetings, and, before graduation, is subject to examination in the department.

Similarly, the Trust has devoted funds towards research on the subject and is at the present time erecting a research department in connection with the new sanatorium-colony and in close relationship with the University.

Tubercle-Free Milk Supply.

In view of the considerable relationship of tuberculosis with milk supply, the Trust have turned their attention to the establishment of a Model Dairy Farm. One hundred acres of land have been acquired. An up-to-date equipment has been installed. The Dairy is now in operation and offers, in addition to tubercle-free milk to its immediate clientèle, an object lesson to the University students of medicine, and, more widely, to the general community.

Immediate Treatment.

A few words regarding present outlook on the curative treatment of tuberculosis. What as to the *immediate cure* of the sick man? What promise does medicine offer that disease-in-progress can be arrested?

If science hesitates to accept any of the short cuts which have been announced, the prospect is none the less full of hope. Nature herself points the road. Nature cures tuberculosis every day. The majority of us are illustrations of such arrest. Individual resistance and satisfactory environment have won the day. The return of medicine within the past half century to Nature's method of aero-therapy and helio-therapy has radically changed the outlook. The realization of Nature's environmental standard of air and light has brought the sanatorium, the open-air school, and like institutions, and vitalized the ever recurring question of housing.

Old-world science and philosophy, which enjoined that "air is more necessary than food" and that "where the sun goes the doctor does not," have been adopted in the modern claim for healthful environment for every citizen. By the acceptance of Nature's methods the prevention and treatment of tuberculosis have been revolutionized. The health of the individual and of the nation—and, in particular, resistance to tuberculosis—will be enhanced in proportion as the dependence of human life on air and light is admitted in practice.

New Remedies: "Consumption Cures."

The other side of treatment concerns the invading bacillus more directly. It is impossible within the limits of the present

review to discuss details of individual methods of treatment that have been proposed. It may, however, serve a useful purpose to emphasize the point that the lines on which effective treatment may be reasonably expected are well known. So-called remedies for tuberculosis—"consumption cures," and the like—are advertised daily and have been with us from time immemorial. For the most part they are devoid of scientific warrant or value. Unfortunately, the sufferer from continuing illness due to the bacillus has become the prey of the commercial adventurer or the quasi-humanitarian dabbler in secret remedies. His " case " is exploited by credulous advisers of every sort, foolish busybodies and unscrupulous charlatans.

Whensoever a "new treatment" is announced and largely boomed in the Press, every member of the community who may find himself interested in the matter, directly or indirectly, will be well-advised to fall back on one of the accredited sources of intelligence on the subject. The British Empire does not lack men who have devoted time and energy to the study and elucidation of the subject and whose opinion on such a point is readily available for the guidance of individual sufferers, institutions concerned with the treatment of patients, and authorities, local or central.

In so far as the "new remedy" is honest and authentic, the principles on which it rests can, without unnecessary details, be freely explained and their scientific validity tested. Thus most of the recently proposed cures have been essentially based on the well-recognized principle of vaccine-therapy, whereby an attempt is made, by means of products obtained from the bacillus itself, to stimulate the natural protective mechanism with which the human body is endowed. The principle and its practical application are well understood.

The author of any new proposal should have no difficulty in stating frankly the principle on which his method rests and should be prepared to outline the fundamental observations on which his statements depend. A failure to fulfil such reasonable demands has led to deception, disappointment and discredit. The ultimate result has been disastrous, not only to the treatment

immediately involved, but to other therapeutic proposals, however sound.

Results of Campaign: Statistical Evidence.

What as to tangible results of the campaign up to date? Have the results justified the expenditure of time, effort and money? In speaking of these it will be my endeavour to deal with the matter on broad lines, citing official statistics, which speak for themselves, and avoiding the attempt to assess the influence exercised by particular elements in the campaign.

Three aspects of the subject suggest themselves for considerations:—(1) The *actual* reduction of mortality from tuberculosis; (2) the *accelerating* rate of reduction within recent times; (3) the remarkable reduction of mortality from tuberculosis compared with that from some other conditions.

(1) *The Actual Reduction of Mortality from Tuberculosis.*

The saving of life has been phenomenal. It is important that due emphasis should be laid on the fact, in view of recurrent statements to the contrary in conversation and in the Press. The following is an example of the fictitious myth which is irresponsibly and unblushingly circulated—often by those who ought to know better. The sentences appeared recently in a London Evening Paper under the heading of "Consumption. Are we failing to grapple with it?" over the signature of a member of the medical profession. "The consumption problem," says the writer, "was never probably more serious than it is to-day. Are we grappling with the great white plague? What is being done to stamp it out? What is London doing? Is the campaign against tuberculosis succeeding or failing? These are questions to which the English public should have answer. . . . Judging by results, success has not been achieved . . . . The death-rate is higher now than it was when the campaign against consumption was initiated by the Insurance Act."

What are the facts?

In respect of England I quote from the Registrar-General's Annual Report (England and Wales) for 1920.

" During the five years 1915-19 the male population was so greatly affected by the war that for these years, as pointed out in previous reports, the movement of tubercle mortality has to be measured by the experience of females alone. Fortunately, their mortality, in recent English experience, bears a fairly constant ratio to that of males; and the return to more normal population conditions in 1920 has rendered it possible once more to determine the latter, and thus to confirm the parallelism of movement for the two sexes, and the reliability of the female rate as an index of what occurred during the war. In the past two years this rate has fallen more rapidly than in any previous similar period of which we have record.

" It is true that the fall *since* 1918 is largely due to the effect of the great influenza epidemic of that year in temporarily arresting a fall which had already commenced, and substituting a continuation of the rise of the previous four years, which, so far as 1918 is concerned, might with more justice be attributed to the activity of influenza than of tuberculosis. But even if on this account we avoid the comparison with 1918, we find that the reduction during the three years since 1917 amounts to 24 per cent, which also represents a much more rapid reduction than had ever been recorded before. So great, in fact, has been the fall that it has not only wiped out the whole of the preceding rise from the previous low record of 1912 to 1917, but has restored the general continuity in the decline of mortality which has been such a marked feature of the records of the past half century."

In respect to Scotland, "the total deaths from all forms of tuberculosis in 1920 were 284 less than those of the previous year, 1,386 less than the mean numbers of the previous five years, and 1,748 less than the mean of the previous ten years. Fifty years ago, that is, in the year 1870, the deaths from tuberculosis numbered 13,027, while in 1920 they numbered 6,042. In other words, compared with the mortality from tuberculosis in the year 1870, the mortality in 1920 was 53.6 per cent less.

" Fifty years ago the death-rate from tuberculosis was 404 per 100,000, as against 124 per 100,000 in 1920. In other words, in fifty years the death-rate has fallen 69.3 per cent.

"The deaths from pulmonary tuberculosis—or so-called phthisis—in Scotland in 1870 numbered 9,448, and in 1920 they numbered 4,194. In the decade 1871-1880, the death-rate from phthisis was 244 per 100,000. In 1920 it was 86 per 100,000." (Report of the Registrar-General for Scotland, 1920.)

Similarly striking figures might be cited with regard to other forms of tuberculosis.

(2) *The Accelerating Rate of Reduction Within Recent Times.*

The recent *acceleration* of rate of reduction, which is noticeable both in England and Scotland, is of arresting interest.

To quote from the Registrar-General of England: "Not only is the absolute fall (of mortality) greater, but, as compared with the lower level of mortality prevalent at the present day, the relative fall is very much greater than would have resulted from an equal absolute fall at an earlier period, had it ever occurred. The death-rate recorded in 1920 is 27 per cent below that of 1918, which represents a rate of reduction never previously approached.

"The uniformity of the average annual decrement of mortality represents an ever-increasing acceleration of the rate of fall, when measured in proportion to the total extent of mortality remaining. It is to this continued increase in the relative rate of fall that we must look for evidence of the effect of the anti-tuberculosis measures of recent years."

In Scotland the *acceleration* of fall in the mortality rate likewise arrests attention. Thus, during twenty years up to 1890, the percentage fall in mortality from all forms of tuberculosis was 35, while during twenty years from 1900-1919 the percentage fall was 45.

(3) *The remarkable Reduction of Mortality from Tuberculosis compared with that from some other Conditions.*

The diminution in mortality from tuberculosis is further emphasized when placed side by side with corresponding figures relating to deaths from cancer.

Thus, the Registrar-General for Scotland states : " In 1920 the deaths from cancer and other forms of malignant disease in Scotland numbered 5,765. The number is 286 more than the mean of the preceding five years and 465 more than the mean of the preceding ten years.

" The cancer death-rate for 1920 was 119 per 100,000, which is eight more than the mean of the preceding ten years, and almost exactly twice the rate for the period 1886-1893.

" While fifty years ago, in 1870, the number of deaths from phthisis outnumbered those from cancer by 7,775, in 1920 deaths from cancer outnumbered those from phthisis by 1,571."

Reassuring Corroboration from Other Fronts.

From the other side of the Atlantic, where throughout the United States similar methods are widely in operation, there comes ample reassurance regarding the result of the campaign.

The anti-tuberculosis measures have been elaborated with care and maintained with characteristic energy. You may recall that, at a great Conference in Albany, New York State, in 1910, the programme of operations for the following ten years was tabled and discussed, and representative opinion was sought from various countries as to the results that might be expected. On a written statement of the proposed machinery (very similar to that we have been considering this evening), the promoters of the movement invited me to cable my view as to the probable outcome. The message sent by me—March, 1910—ran as follows :—"Prosecute great programme proposed : Watch child as potential tuberculosis seedling; correct faulty compulsory environment, and expect 40 per cent reduction by 1920, and practical disappearance within generation and a half."

The statistics for New York State are not in my hands, but those for New York City, cited in a recent article by Dr. Haven Emerson, the well-known American statistician, are illuminating. They indicate that, during the past fifty years, there has been a drop of 77.9 per cent in the tuberculosis death-rate of New York City, and that, during the past eleven years, the drop has actually amounted to 51 per cent. Dr. Emerson emphasizing the contribution to this eminently satisfactory result made by

the earlier and more accurate diagnosis of all forms of tuberculosis, especially pulmonary, says: "It would appear that no other single specific factor has been of as much value in the attack upon tuberculosis. In the years 1909-1920 inclusive, 251,000 new patients were examined for tuberculosis, 1,469,000 separate visits were made by patients to tuberculosis dispensaries, and 961,000 separate visits were made by nurses to the homes of tuberculosis patients in New York City."

The striking fall in death-rate from tuberculosis—and its conspicuous acceleration in recent times—is not universal in civilized countries. It has occurred pre-eminently in Britain and in the United States. It is, so far, little traceable in France where, admittedly, up to the last year or two, concerted action against tuberculosis conspicuously lagged behind.

In Conclusion.

Those various statistics are of immense interest. They seem clearly to justify the reflection that the adoption of well conceived, specialized measures in relation to tuberculosis *is* followed by results worth the cost and that, in the absence of such measures, the tuberculosis death-rate continues high, notwithstanding the more general improvement of hygiene attained by civilizations such as that of France.

The justness of the view is emphasized by the fact that while, in this country, a remarkable reduction has occurred in the mortality from tuberculosis, other communal diseases, such as cancer, have shown not only no diminution, but an actual increase of mortality, in spite of the general improvement of social environment and the corresponding heightening of the level of health.

The statistics offer ample encouragement to continued development of anti-tuberculosis efforts. After forty years participation in, and close study of the campaign, I am satisfied that, if we maintain trench-warfare patiently, with its steadily increasing attrition of the enemy—combining it with frontal attack, as scientific discovery may render that possible—a complete and lasting victory will be achieved.

APPENDIX.

DEATH-RATE PER 100,000 POPULATION FROM TUBERCULOSIS IN LARGER CITIES OF GREAT BRITAIN AND IRELAND DURING 1920.

CITIES OF GREAT BRITAIN AND IRELAND.	Estimated Population.	All Tuberculosis
London	4,531,971	127
Glasgow	1,098,568	149
Birmingham	895,915	113
Liverpool	803,452	173
Manchester	770,597	143
Sheffield	492,570	118
Leeds	448,913	158
Dublin Area	415,000	238
Belfast County Borough	413,000	237
Bristol	375,641	122
Edinburgh	334,942	124
Bradford	293,979	111
Newcastle-on-Tyne	286,061	175
Dundee	184,084	137
Aberdeen	164,907	129

DEATH-RATE PER 100,000 POPULATION FROM TUBERCULOSIS IN AMERICAN AND EUROPEAN CITIES (OUTSIDE GREAT BRITAIN) DURING 1920.

AMERICAN CITIES.	Estimated Population.	All Tuberculosis	EUROPEAN CITIES.	Estimated Population.	All Tuberculosis
Philadelphia	1,837,924	137	Vienna	1,842,005	405
Indianopolis	314,194	132	Budapest	—	376
Newark	414,216	130	Warsaw	—	338
San Francisco	520,546	128	Prague	487,000	324
Boston	751,251	127	Florence	248,587	298
New York	5,663,980	126	Paris	2,905,248	279
Pittsburgh	591,033	119	Köln	656,617	189
Cleveland	808,268	108	Leipzig	621,351	179
Buffalo	519,608	102	Berlin	1,931,330	177
Chicago	2,728,022	97	Dusseldorf	414,900	172
St. Paul	290,000	89	Amsterdam	650,758	156
Washington	437,571	85	Hamburg	1,011,000	152

DEATH-RATE PER 100,000 POPULATION FROM ALL FORMS OF TUBERCULOSIS IN VARIOUS CAPITALS (1913-1921).

	1913	1916	1919	1921
LONDON	165	189	145	128
EDINBURGH	168	157	140	134*
NEW YORK	199	182	152	103
PARIS	328	307	248	244
VIENNA	302	357	490	405
	*Extended City Area.			(1920)

DEATH-RATE PER 100,000 POPULATION FROM ALL FORMS OF TUBERCULOSIS IN PARIS AND IN TOWNS OF OVER 5,000 POPULATION IN FRANCE.

Paris.		Other Towns of France.	
1891-1895	409	1891-1895	255
1896-1900	379	1896-1900	249
1901-1905	390	1901-1905	270
1906-1910	371	1906-1910	270
1911	342	1911	262
1912	334	1912	258
1913	323	1913	258

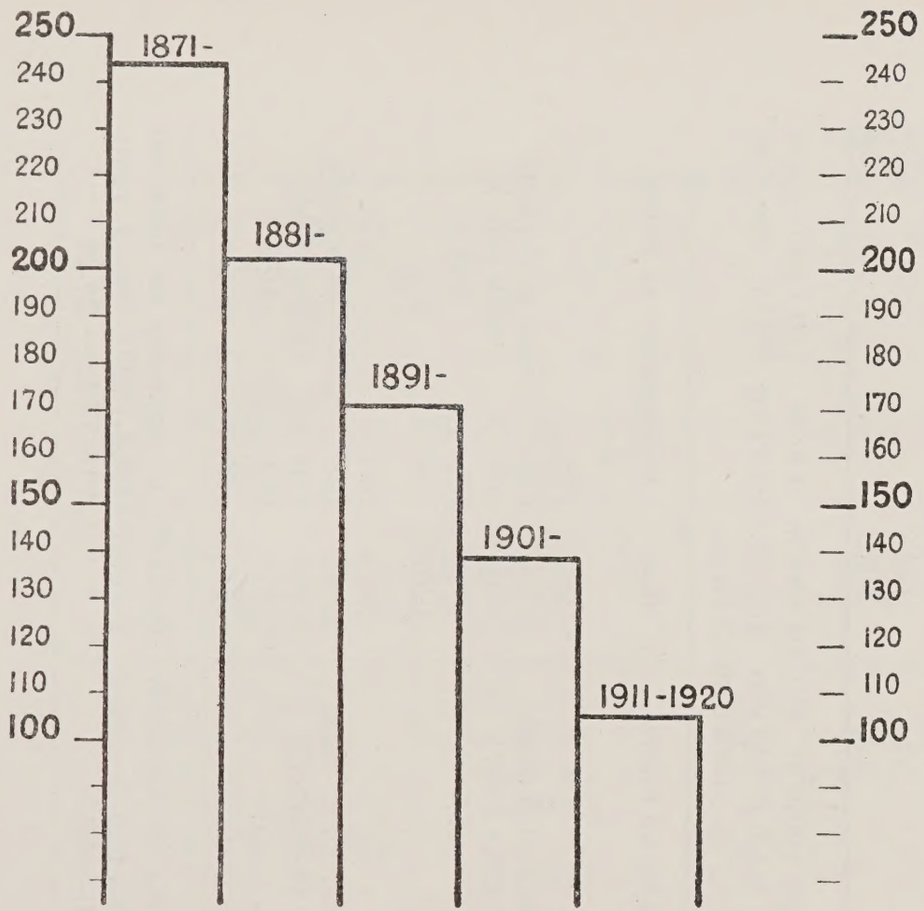
DEATH-RATE PER 100,000 POPULATION FROM TUBERCULOSIS IN BIRMINGHAM, ILLUSTRATING *ACCELERATING FALL* WITHIN RECENT YEARS.

Year.	Tuberculosis—All Forms.		Year.	Tuberculosis—All Forms.	
1883	220		1903	176	
1884	227	Mean of 5 years	1904	175	Mean of 5 years
1885	221	(1883-1887)	1905	167	(1903-1907)
1886	209	217	1906	151	165
1887	209		1907	154	
1898	187		1918	160	
1899	210	Mean of 5 years	1919	128	Mean of 5 years
1900	208	(1898-1902)	1920	110	(1918-1922)
1901	231	208	1921	113	125
1902	206		1922	113	

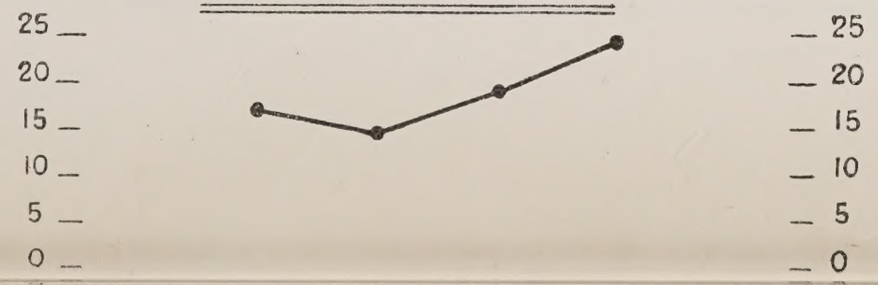
Percentage decrease as between 5 years (1883-1887), and 5 years (1898-1902)—4.15

Percentage decrease as between 5 years (1903-1907), and 5 years (1918-1922)—24.24

Death-rate from Pulmonary Tuberculosis in Scotland in each Decade, 1871-1920



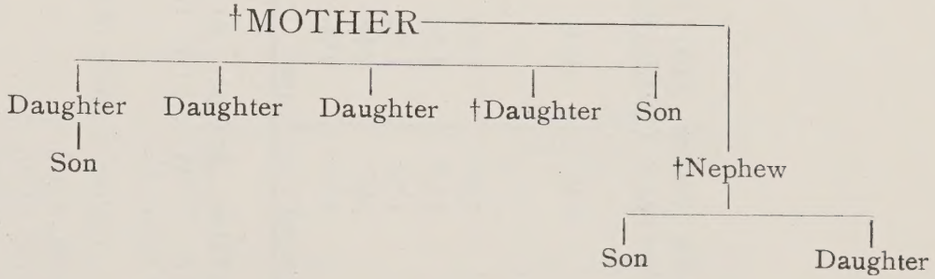
Percentage of Decrease for each Decade as compared with Preceding Decade



TUBERCULOSIS IN HOUSEHOLDS.

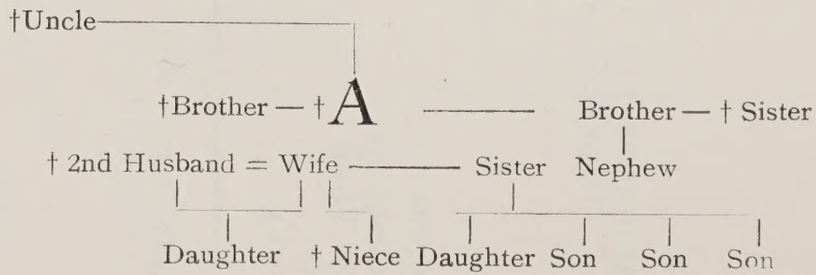
Examples of Wide Distribution, as determined by Systematic Examination of "Contacts."

I.



Total, 10 Cases.

II.



Total, 15 Cases.

†= "**died** under observation."